Installation | Safety instructions | Maintenance

Photovoltaic modules user manual
ET Solar series module

Please carefully read the following installation and safety instructions. Non-compliance with these instructions may void the module warranty.

Purpose of this guide

This guide contains information regarding the installation and safe handling of ET Solar photovoltaic modules (hereafter referred to as "modules"). All instructions should be read and understood before attempting installation. If there are any questions, please contact your dealer or ET Solar for further information. The installer should conform to all safety precautions in the guide when installing modules. Before installing a solar photovoltaic system, the installer should become familiar with the mechanical and electrical requirements for photovoltaic systems. Keep this guide in a safe place for future reference. If not otherwise specified, it is recommended that the requirements of the U.S. National Electrical Code (NEC) or respective European Code be followed.

General

- ✓ Installing solar photovoltaic systems requires specialized skills and knowledge. The installer assumes all risk of injury, including risk of electric shock. Module installation should be performed only by qualified persons.
- ✓ All modules come with a permanently attached junction box and #12 AWG (4 mm^2) wire terminated in Multi Contact PV connectors. Your dealer can provide additional extension cables to simplify module wiring.
- ✓ Each individual module can generate DC voltages greater than 30 volts (V) when exposed to direct sunlight. Contact with a DC voltage of 30 V or more is potentially hazardous. Exercise caution when wiring or handling modules exposed to sunlight.
- ✓ When disconnecting wires connected to a photovoltaic module that is exposed to sunlight, an electric arc may occur. Arcs can cause burns, start fires or otherwise create safety problems. Exercise caution when disconnecting wiring on modules exposed to sunlight.
- ✓ Photovoltaic solar modules convert light energy to direct-current electrical energy, and are designed for outdoor use. Proper design of support structures is the responsibility of the system designer and installer.
- ✓ Modules may be ground mounted, pole mounted, or mounted on rooftops.
- ✓ Do not apply paint or adhesive to the module.
- ✓ When installing modules, observe all applicable local, regional and national codes and regulations. Obtain a building and/or electrical permit where required.
- ✓ Storage Temperature:-10℃～40℃, Storage Humidity:≤70%RH;
- ✓ Use environment temperature:-40～85℃,other use of harsh conditions please indicate.

Do not attempt to disassemble the module, and do not remove any attached nameplates or components. Doing so will void the warranty.

Do not use mirrors or other hardware to artificially concentrate sunlight on the module.

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Safety precautions for installing a solar photovoltaic system

- ✓ Solar modules produce electrical energy when exposed to sunlight. DC voltages may exceed 30V on a single exposed module.
- ✓ Only connect modules with the same rated output current in series. If modules are connected in series, the total voltage is equal to the sum of the individual module voltages.
- ✓ Only connect modules or series combinations of modules with the same voltage in parallel. If modules are connected in parallel, the total current is equal to the sum of individual module or series combination currents.
- ✓ Bypass diodes are preassembled in each module. Do not remove these diodes.
- ✓ Keep children well away from the system while transporting and installing mechanical and electrical components.
- ✓ Completely cover all modules with an opaque material during installation to prevent electricity from being generated.

Do not wear metallic rings, watchbands, ear, nose, or lip rings or other metallic devices while installing or troubleshooting photovoltaic systems.

Use appropriate safety equipment (insulated tools, insulating gloves, etc) approved for use on electrical installations.

- ✓ Observe the instructions and safety precautions for all other components used in the system, including wiring and cables, connectors, DC-breakers, mounting hardware, inverters, etc.
- ✓ Use only equipment, connectors, wiring and mounting hardware suitable for use in a photovoltaic system.
- ✓ Always use the same type of module within a particular photovoltaic system.
- ✓ Under normal operating conditions, PV modules will produce currents and voltages that are different than those listed in the date sheet. Data sheet values are applicable at standard test data.
- ✓ Short-circuit current and open-circuit voltages should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor ampacity, fuse sizes and size of controls connected to the module or system output. An additional multiplying factor of 125 percent (80 percent de-rating) may be applicable.

General installation notes

- ✓ Drainage holes must not be covered with parts of the mounting system. The junction box has a breather port which must be mounted facing downward and cannot be exposed to the rain. The junction box should be on the higher side of the module when it is mounted in order to orient the breather port correctly.
- ✓ Do not lift the module by grasping the module's junction box or electrical leads.
- ✓ Do not stand or step on module.
- ✓ Do not drop the module or allow objects to fall on the module.
- ✓ Do not place any heavy objects on the module.
- ✓ Do not scratch the anodized coating of the frame (except for grounding connection).
- ✓ Do not scratch the glass surface.
- ✓ Prior to installation, do not store modules outdoors or in a damp environment.
- ✓ Inappropriate transport and installation may damage the module glass or frame.

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Mechanical Installation

Selecting the location

- ✓ Select a suitable location for installation of the module.
- ✓ For optimum performance, the module must be facing true south in northern latitudes and true north in southern latitudes.
- ✓ For detailed information on optimal module orientation, refer to standard solar photovoltaic installation guides or a reputable solar installer or systems integrator.
- ✓ Shading on the module will reduce electricity production.
- ✓ Do not install the module near equipment or in locations where flammable gases can be generated or collected.

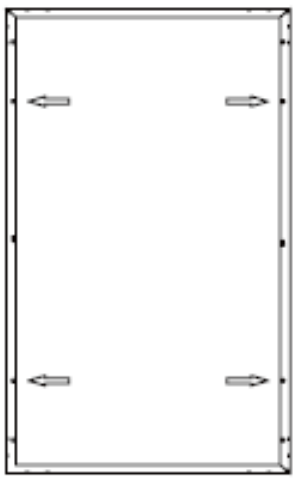
Selecting the proper mounting structure and hardware

- ✓ Observe all instructions and safety precautions included with the mounting system to be used with the module.
- ✓ Do not drill holes in the glass surface of the module. Doing so will void the warranty.
- ✓ Do not drill additional mounting holes in the module frame. Doing so will void the warranty.
- ✓ Modules must be securely attached to the mounting structure using four mounting points for normal installation. If heavy wind or snow loads are anticipated, additional mounting points should also be used. Please see the drawing below.
- ✓ Load calculations are the responsibility of the system designer or installer.
- ✓ The mounting structure and hardware must be made of durable, anti-corrosion and UV-resistant material.

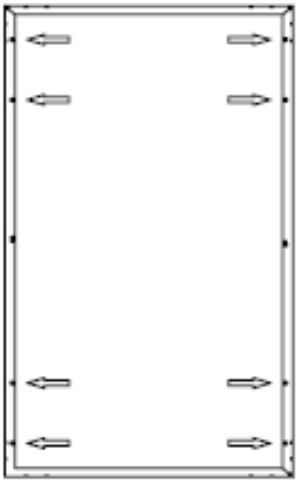
Mounting methods

1. Mounting with Bolts

- ✓ The module must be attached and supported by at least four bolts through the indicated mounting holes.
- ✓ Most installations will use the four inner mounting holes on the module frame(include short frame mounting holes).
- ✓ Depending on the local wind and snow loads, additional mounting points may be required. (e.g. if the snow load is as high as 5400pa, please use eight bolts)



Use four mounting holes



Use eight mounting holes

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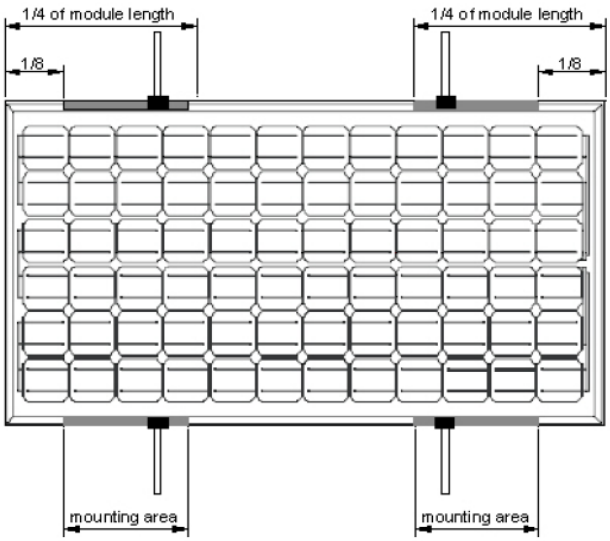
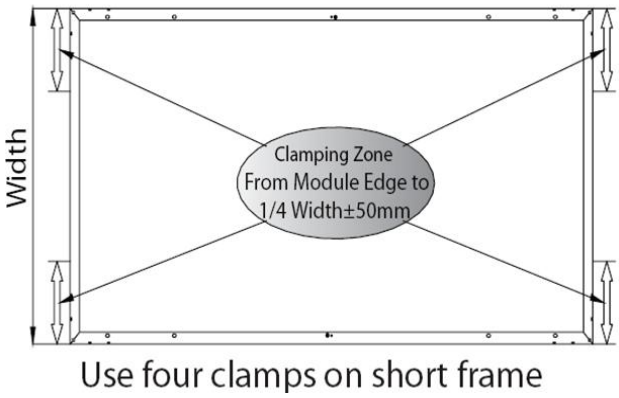
2. Mounting with Clamping Hardware

- ✓ If module clamps are used to secure the module, the torque on the clamp bolt should be around 8–10 Nm.
- ✓ A minimum of four module clamps should be used, two on each long/short frame side, in the general clamping areas denoted by the wide arrows on the drawing.
- ✓ Depending on the local wind and snow loads, additional module clamps may be required. (e.g. if the snow load is as high as 5400pa, please use eight clamps on the long frame)





Use four clamps on short frame

3. Zero-Rack modules mounting with Zep Compatible hardwares

- ✓ The array of Zero-Rack modules must be mounted to the roof with Zep Leveling Feet and suitable roof attachment devices to maintain the waterproof integrity of the roof. The system designer and/or installer are responsible for load calculation and proper quantity and locations of the Zep Leveling Feet. Local wind loading and snow loading should be accounted for in the system design.
- ✓ The mounting system design shall comply with all local building codes.
- ✓ A minimum gap of 0.25” between modules is required to allow for thermal expansion.
- ✓ The system must not be immersed in water or constantly exposed to water spray.
- ✓ For more details, please visit the official website of Zep Solar (www.zepsolar.com).
- ✓ Warranty void if non-Zep-certified hardware is attached to groove in module frame.

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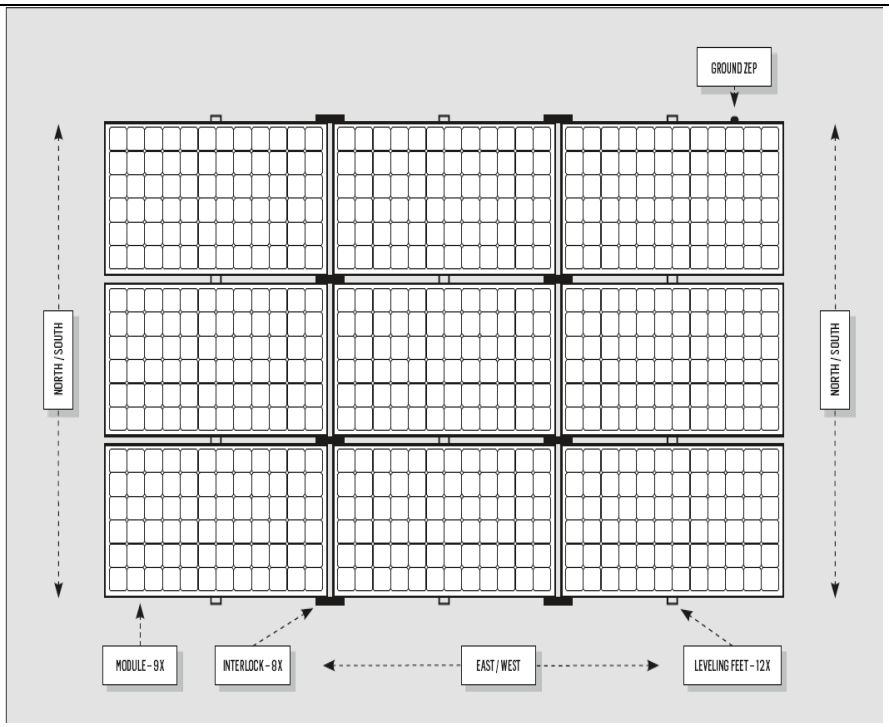

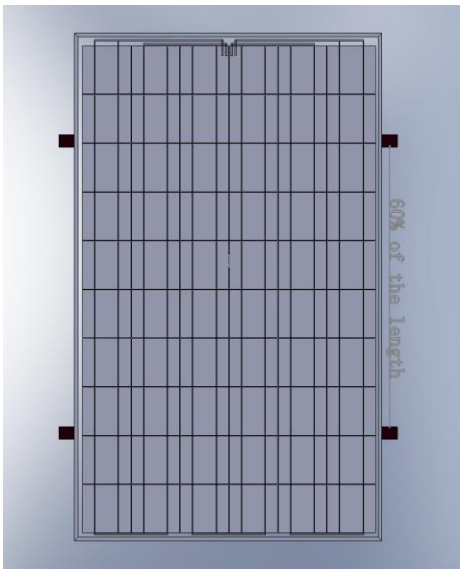

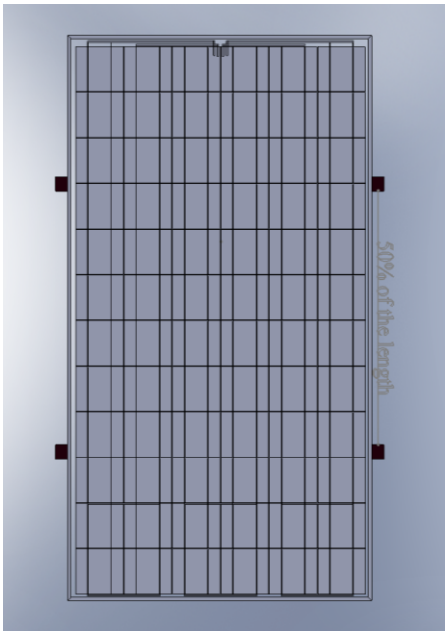

P660&M660&M572 **P672&M672**

Zep System I&II , mechanical load up to 5400pa

3. Other

✓ Other mounting methods are acceptable as long as the minimum requirement as described under 2. Mounting with clamping hardware are met.

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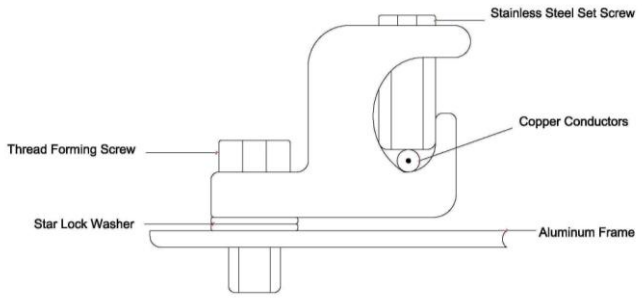
Electrical Installation

Grounding

- ✓ All module frames must be properly grounded.
- ✓ Observe all local electric codes and regulations.
- ✓ A bonding or toothed washer is required to make proper and reliable electrical grounding connection with the anodized aluminum frame.
- ✓ Devices listed and identified for grounding metallic frames of PV modules are permitted to ground the exposed metallic frames of the module to grounded mounting structures.
- ✓ Consider using a lay-in lug, rated for outdoor use, if the module grounding conductor is to be larger than #10 AWG.
- ✓ When using lay-in lugs, the grounding conductor should be inserted into the opening indicated in the figure, and secured using the set screw.
- ✓ Expect for equipment grounding, ET Solar recommends the negative pole of PV module array is connected to earth during all PV system installations. That will keep optimal performance of PV Power Plants, which are located in a hot, high humidity climate and high Maximum System Voltage.

Please use our recommended grounding method below on the long frame when the modules are used in salty environment.



PV module grounding with lay in lug (φ 4mm grounding holes)

Wire

- ✓ There are two cables used in the junction box and the two cables have polarity marking respectively. At the opposite end of the cables, the positive (+) cable connects male (+)connector and the negative (-)cable connects female（-）connector .This makes easy series connection of adjacent modules by firmly inserting the male connector of a module into the female connector of an adjacent module until the connector is fully seated which include cables and connectors so that the modules have been designed to be easily interconnected in series configuration.
- ✓ When for connecting, the cables could not cross each other and keep away from direct sunlight, heat source and immersion. Besides, the cables should keep about at least 25 mm distance each other by securing on the mounting structure. Also, please make sure that there is no live part of the cable which could touch or have this potential.
- ✓ When for connectors connecting, please keep connectors dry and clean, and ensure that

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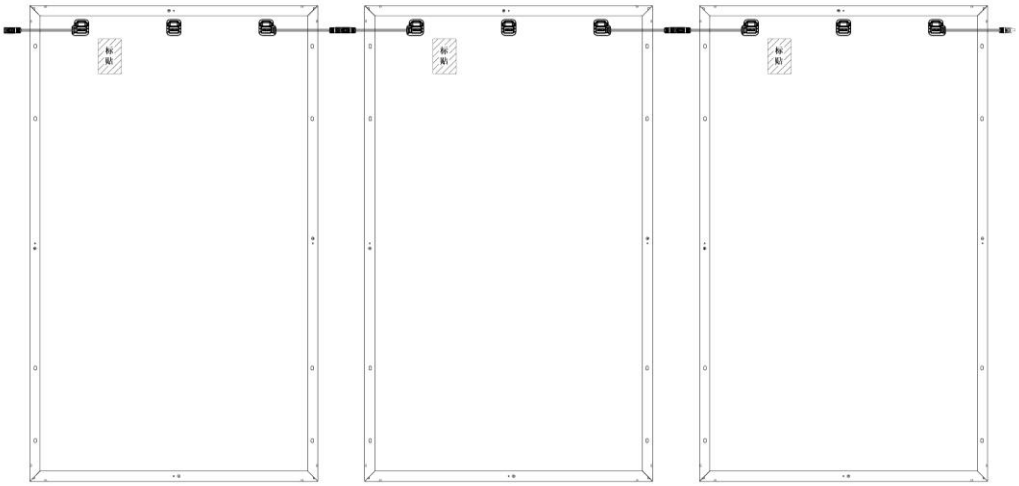
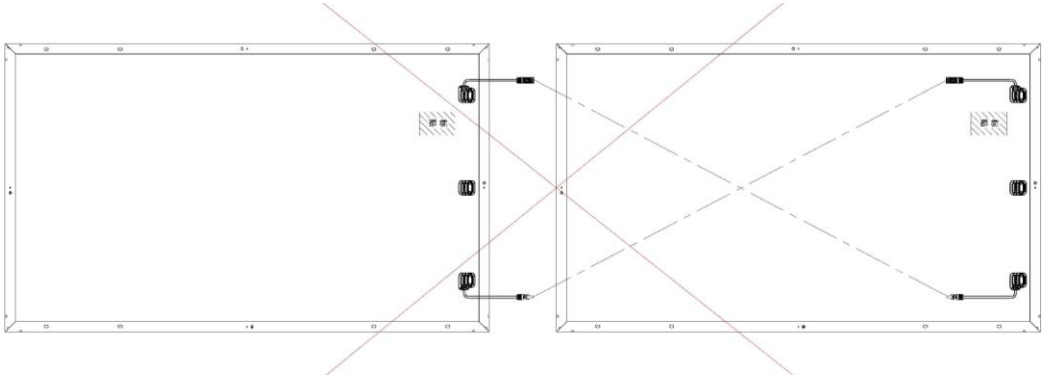
connector caps are handed tight. Do not attempt making an electrical connection with wet, soiled, or otherwise faulty connectors. Avoid direct sunlight exposure and water immersion. Faulty connections can result in arcs and electrical shock. Check all electrical connections and make that fully engaged and securely lock. Also, the connectors could not cross each other and keep about at least 25 mm distance each other by securing on the mounting structure.

- ✓ When for module strings in parallel connecting to the distribution box, please use suitable third-party PV system connectors with suitable length PVF type cable which are each qualified for EN50521 and 2Pfg 1169 . For field wiring with suitable cross-sectional areas that are approved for use at the maximum short-circuit current of the PV module. ET Solar recommends installers use only sunlight resistant cables (PVF1 type) for direct current (DC) wiring in PV systems. The recommending minimum wire size should be 4 mm^2 and must be subject to the local national codes and regulations.
- ✓ For ET Solar Castor Modules, The cable must be connected rightly.



Castor modules cable connection (right)



Castor modules cable connection (wrong)

General electrical installation

- ✓ Do not use modules of different configurations in the same system.
- ✓ This module is supplied with Multi Contact connectors for electrical connections.
- ✓ Refer to local code to determine appropriate types and temperature ratings of

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conductors. Wiring should be #12 AWG, 4 mm² (minimum) and must be temperature rated at 90 °C (minimum).
- ✓ Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- ✓ Refer to local code to determine over current, conductor ampacity and size requirements.
- ✓ Installation shall be in accordance with local code.
- ✓ For best performance, ensure that positive and negative DC wires run closely together avoiding loops.

WARNING!
Electrical shock hazard!
Do not touch bare conductors or other potentially energized parts.

Testing, debugging and troubleshooting

- ✓ Blocking diode can be used in PV system to prevent reverse current from the battery if there is no photo current in the module. If charge controllers are not used, then it is recommended to use blocking diodes. For more details on charge controllers, please consult with professionals.
- ✓ In cases where two or more modules are connected serially in a system, if part of the modules are occluded and the other part are exposed to the sun, the high reverse current will flow partially or completely through the module, causing the modules to overheat and even damaging the modules. Bypass diode used in modules can protect modules from such impact of excessive reverse current.. The bypass diodes have been integrated in the junction box.
- ✓ Operators should protect themselves from electrical shock during debugging or maintenance of solar systems.

Test procedure for modules serial connected before connect them to the PV system.
- ✓ Use digital multimeter to check the total open circuit voltage of the serially connected modules. The results should be equal to the sum of the open circuit voltage of individual modules, which can be found from the label on the modules. If the total open circuit voltage is much lower than expected, please follow the following procedure in this instruction.

Troubleshooting for low voltage
- ✓ There are two causes of low open circuit voltage, environmental change or circuit fault. The drop of irradiance or increase of environmental temperature reduces the open circuit voltage, which is normal. The troubleshooting here refers to the low voltage caused by circuit faults, which is usually due to incorrect connection of terminals or damage of bypass diodes.
- ✓ First, check all wiring connections, and ensure they are well-connected.into the PV system. Then check the modules each by each as below:
- ✓ Measure the open circuit voltage of a module.
- ✓ Cover the module completely with opaque material.
- ✓ Disconnect the module from the system.
- ✓ Remove the opaque material from the module, and measure its open circuit voltage.
- ✓ If the measured voltage is one third or two thirds of the rated value, it indicates that bypass diodes were broken,and should be replaced.

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Maintenance

ET Solar recommends the following maintenance items to ensure optimal performance of the module:

- ✓ Clean the glass surface of the module as necessary. Use water and a soft sponge or cloth for cleaning. A mild, non-abrasive cleaning agent can be used if necessary. Do not use dishwasher detergent. Do not have water staying on the glass surfaces of PV modules for a long time.
- ✓ If a module power decreases abnormally, and its glass surface is found covered by dust, please contact your module installer, retailer or ET solar immediately for technical support.
- ✓ Do not attempt to clean a module if the front glass is broken or the backsheet is perforated.
- ✓ Electrical and mechanical connections should be checked periodically by qualified personnel to verify that they are clean, secure and undamaged.
- ✓ Check the electrical and mechanical connections periodically to verify that they are clean, secure and undamaged.
- ✓ Problems should only be investigated by qualified personnel.
- ✓ Observe the maintenance instructions for all other components used in the system.

Shutting down the system

- ✓ Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
- ✓ Disconnect system from all power sources in accordance with instructions for all other components used in the system.
- ✓ The system should now be out of operation and can be dismantled. In doing so, observe the all safety instructions as applicable to installation.

Electrical ratings of the concerned modules:

Pls refer to each kinds of ET module datasheet.

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Information about manufacturer:

ET Solar China
19F, Block C, Wanda Plaza
Jianye District, Nanjing 210019, China
Tel: 86 25 86898098
Fax: 86 25 86898097
E-mail: support@etsolar.com

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